

ARCHAEOLOGICAL CASE STUDY

THE BIOARCHAEOLOGY OF THE STILLWATER MARSH, NEVADA

THE PREVIOUS TWO CASE STUDIES dealt with osteological remains in the very recent past. Such forensic osteology cases represent an application of knowledge about the human skeleton to specific questions regarding individual identification and reconstructions of very recent human behavior. The next four case studies show how knowledge of human osteology can be applied in attempts to understand the more distant past. The first two case studies involve the relatively recent archaeological past, whereas the final two involve human paleontology.

The term “**bioarchaeology**” refers to the study of the human biological component of the archaeological record. Bioarchaeology is therefore a newer name for an old subfield of human osteology. Just like other subfields such as forensic osteology or hominid paleontology, bioarchaeology is multidisciplinary and uses the latest techniques to reveal as much as possible from skeletal remains. For example, the work of Phil Walker and colleagues (for example, Lambert and Walker, 1991) on native populations inhabiting the area adjacent to the Santa Barbara Channel in California has employed data from deep sea cores and tree rings, artifact assemblage change, archaeological evidence of trade, spatial patterning and density of habitation sites through time, and even early mission records. These data have been integrated with osteological evidence of paleopathology, demography, and isotopic composition in an effort to understand the evolution of social complexity. The present case study is another bioarchaeological analysis, the case of the Stillwater Marsh in Nevada. The account below is drawn directly from Larsen and Kelly (1995) and Larsen et al. (1996).

25.1 Background

The lives of hunting and gathering people were thought of by early anthropologists as short and difficult, but ethnographic studies changed that view by the 1960s. Even though all hominid subsistence was based on foraging economies until the relatively recent advent of agriculture, by the time anthropologists could scientifically study hunting and gathering societies, these foragers had already been forced into mostly marginal habitats by surrounding agriculturalists. Their lifeways had been substantially disturbed through contact. Because of this, the archaeological record has proven invaluable in illuminating forager lifeways. Because skeletal and dental indicators provide a cumulative biological history of an individual's lifetime and can record stress,

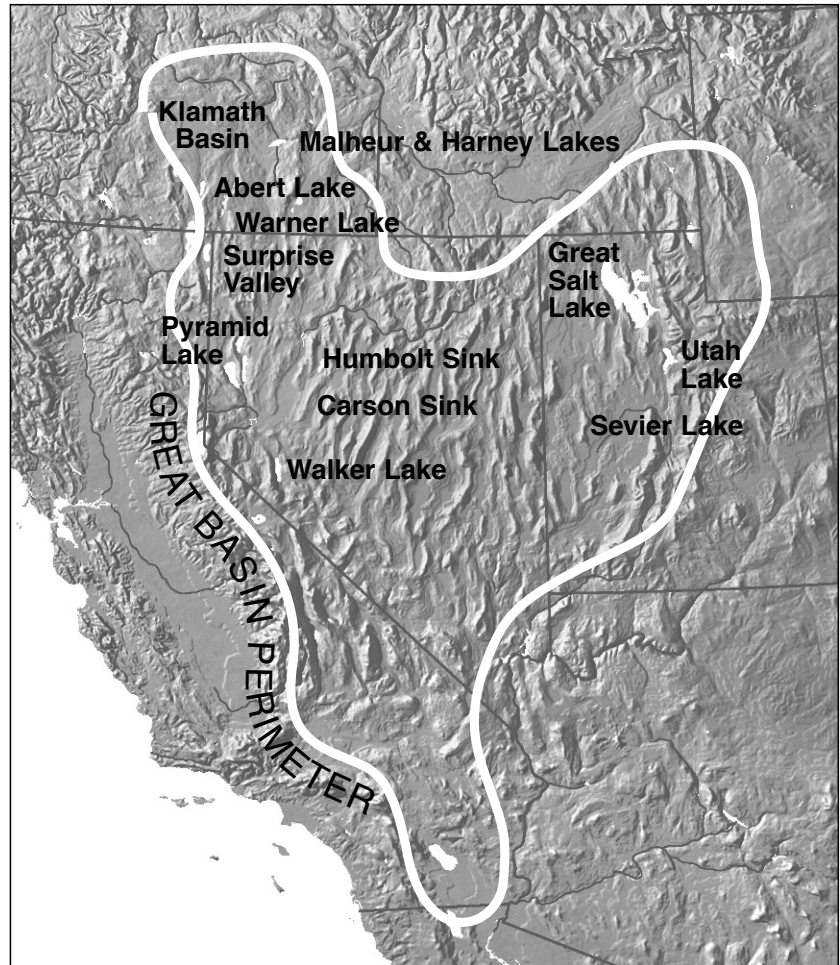


Figure 25.1 **The Great Basin.** Stillwater Marsh is on the eastern edge of the Carson sink. From Larsen and Kelly (1995).

nutrition, disease history, and physical activities, osteological remains are paramount in the study of human adaptation in the past. The conditions in the Great Basin of western North America (Figure 25.1) have preserved a remarkable archaeological record of occupation, a record that is now being enhanced more than ever before through the detailed, multidisciplinary analysis of human skeletal remains.

25.2 Geography of the Carson Sink

The Carson Desert is an extensive area of sand dunes, alkali flats, and slightly alkaline marshes covering an area of about 2800 km² at a distance of about 100 km east of the present city of Reno, Nevada. This area, one of the lowest in the Great Basin, is the landlocked drainage terminus for the Carson River, which feeds the Stillwater Marsh, an ecologically rich area inhabited for many years by pre-Columbian aboriginal populations who subsisted on the area's bounty (Figure 25.2). For the most part, these people buried their dead throughout the marsh rather than at cemeteries, a mortuary pattern likely to be characteristic of many prehistoric foraging groups.

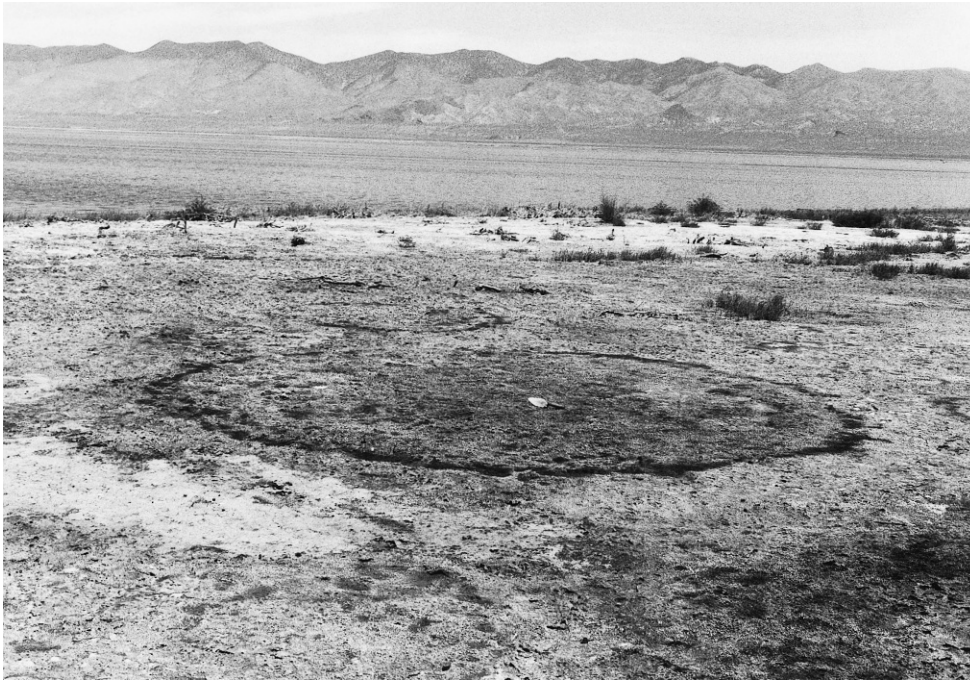


Figure 25.2 Overview of the Stillwater Marsh area. The circle represents a probable house feature exposed by flooding. From Larsen and Kelly (1995).

25.3 Exposure and Recovery

Between 1982 and 1986, record winter precipitation resulted in massive flooding of several Great Basin wetlands, including the Stillwater Marsh. As the floodwaters withdrew in 1985 and 1986, many archaeological sites were exposed. Hundreds of burials were uncovered, as were trash and cache pits, artifacts, and pithouse sites. The alarming nature of the exposed human remains led a local resident and amateur archaeologist to alert state and federal authorities to the exposure of these valuable resources. The Nevada State Museum salvaged the disturbed remains, including 416 burials or individuals. Wind and wave erosion continued to disturb burials in the region, and in 1987 archaeological crews under the direction of Clark Larsen and Robert Kelly surveyed the most heavily impacted marsh shoreline. Additional remains were recovered by this effort. The combined skeletal sample is the largest of any reported to date from the Great Basin. In turn, many of the analytical techniques employed in the assessment of these remains represent the first of their type to be conducted on prehistoric Great Basin skeletal remains.

Six of the burials in the Stillwater series were radioisotopically dated, using radiocarbon. The dates range from ca. 2300 to 300 B.P. The predominant period represented by projectile points found in the sometimes associated archaeological sites was the Undertown phase (1250–650 B.P.). The skeletal series was treated, for the purpose of the analysis, as a single population. However, it is obvious that it is merely a tiny sample of the total human population inhabiting the Stillwater area over thousands of years. It is important to note that the human remains from Stillwater Marsh were not from cemeteries but rather from isolated graves scattered throughout the marsh region, indicating a probable lack of formal disposal areas (Figures 25.3 and 25.4). The remains represent a series of small samples drawn at unknown intervals from a larger population over a span of centuries, if not millennia, rendering paleodemographic analysis problematic.

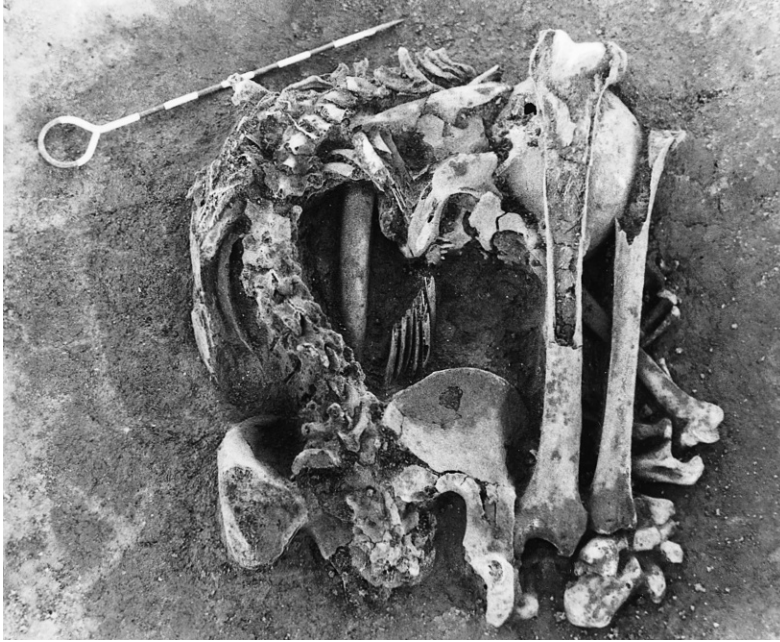


Figure 25.3 Flexed burial from Stillwater Marsh. From Larsen and Kelly (1995).



Figure 25.4 Burial from Stillwater Marsh. From Larsen and Kelly (1995).

25.4 Analysis

The biocultural analysis, therefore, necessitated a different approach from the ones usually employed on cemetery assemblages of skeletons. What were the problems encountered by the analytical team? First, there was an increased probability that the remains were not representative of the population from which they were drawn. Second, relative chronological placement was very difficult, particularly because most burials did not contain directly associated diagnostic artifacts.

The individual remains were all analyzed. Age, sex, and stature were all determined according to standard procedures (Chapter 18). Computed tomographic scanning of selected humeri and femora was undertaken at the Veterans Administration Hospital in Reno. Bone fragments were sampled for stable isotope and genetic analyses. Discrete trait analysis showed homogeneity among the remains, as did skeletal measurements (Brooks et al., 1988), so they were treated as a single sample for the purposes of the analysis. The five goals of the project were as follows:

1. to provide a description of the remains;
2. to assess the quality of life;
3. to improve documentation and understanding of population history;
4. to characterize diet; and
5. to identify physical activity patterns.

25.5 Affinity

There are long-standing debates about population movements in the Great Basin. Linguistic data suggest that Numic-speaking people arrived between 1000 and 700 B.P. Study of serum albumin derived from the skeletal remains revealed similarity with modern Numic speakers, but because the skeletal remains with the shared allele were undated, these results did not bear on the issue of entry of these people into the area. The analysis of mitochondrial DNA showed a very low frequency of the 9-basepair deletion, a deletion observed in some prehistoric and extant Native American populations. This suggested that the Stillwater population was probably not ancestral to any group with a high frequency of this deletion (e.g., California Penutian, Zuni, Yuman, Washo, or Southern-Uto-Aztec language groups). The molecular analyses left several possibilities open regarding the identification of ancestral-descendant relationships in the Great Basin and beyond, but this study constitutes an important step in the ongoing work in this direction.

25.6 Osteoarthritis

Over three quarters of the individuals in the skeletal series were affected by osteoarthritis, and all individuals over 30 years of age showed this pathology. The highest frequency was in the lumbar vertebrae, but cervical vertebrae and elbows had frequencies of more than 50%. Controlling for age, there were several differences between males and females. The Stillwater series exhibited a pattern of sexual dimorphism in osteoarthritis prevalence, with the males more affected than females, with the exception of the lumbar vertebrae (Figure 25.5). This suggests that women frequently carried heavy loads (perhaps children, firewood, water, and/or food). Males had significantly higher frequencies of osteoarthritis in the hip and ankle.

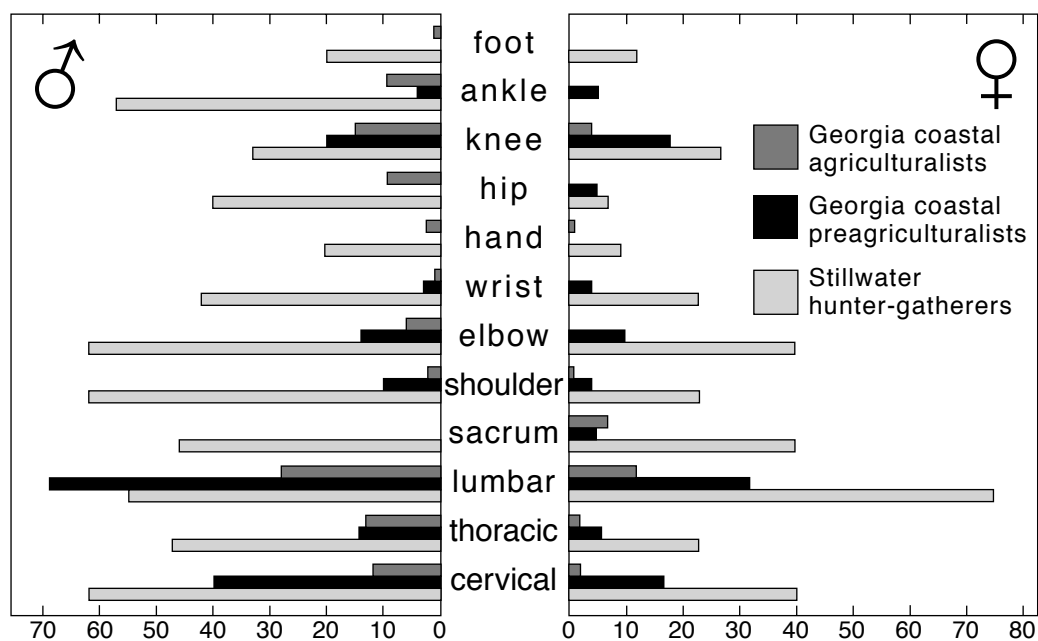


Figure 25.5 Prevalence of osteoarthritis among different Native American groups. Stillwater rates are shown as the lighter bars. From Larsen and Kelly (1995).

The rates of osteoarthritis prevalence are very high relative to other skeletal series. This was interpreted to mean that these foragers engaged in physically demanding activities, particularly high levels of mechanical loading of the spine. Several individuals had vertebral compression fractures (Figure 25.6). The investigators conclude that frequent foot transport of heavy loads might be implicated in these pathologies. They make reference to ethnographic accounts suggesting that the recent inhabitants of this region routinely engaged in physically demanding activities.

25.7 Limb Shaft Cross-Sectional Anatomy

The Stillwater series showed a consistent pattern of elevated bone strength relative to comparative samples, which the investigators interpreted to reflect high bending and torsional loading modes. The humeral values were low relative to the femoral values. The low bone mass (small total amount of cortical bone) in both elements relative to other skeletal series, when controlled for age, was interpreted to reflect episodic under-nutrition. Comparison of males and females showed high dimorphism, suggesting that females were less mobile and more “tethered” to the marsh setting.

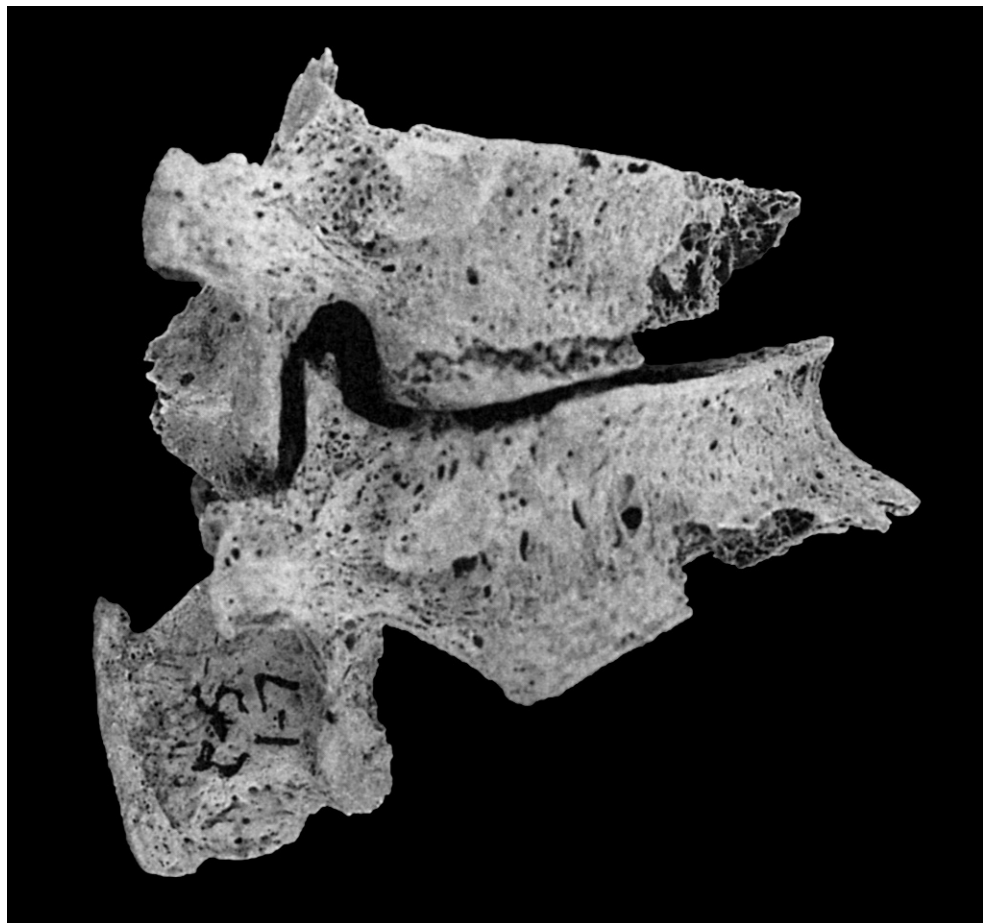


Figure 25.6 Compression fractures of lumbar vertebral bodies. From Larsen and Kelly (1995).

25.8 Physiological Stress

Dental hypoplasias are nonspecific growth arrest markers in teeth that give evidence of the periodicity and intensity of stress (Chapter 19). Two thirds of the individuals studied showed at least one hypoplasia, concentrated at 3–4 years of age. Overall, the Stillwater series showed relatively low levels of hypoplasia prevalence compared to other populations. Only 16% of the individuals showed periosteal inflammation, mostly of the tibia. This was also low relative to most other North American forager series. Although stress was not severe, it was present at appreciable levels. The investigators propose that the narrow hypoplasias and the bone mass data suggest that the Stillwater populations suffered from episodic nutritional stress.

25.9 Dietary Reconstruction

Stable carbon and nitrogen isotopic analysis of human bone samples showed that a variety of foods were consumed. The juvenile samples analyzed fell completely within the adult range, suggesting no age-related differences in diet. There were no differences between adult males and females and no differences between burials from different sites. The wide dispersion of isotopic values in the series indicated that some individuals consumed almost entirely C_3 plants, whereas others ate significant amounts of food with the C_4 isotopic signature. The relatively positive $\delta^{15}N$ values were interpreted to indicate that the diet did not include pinyon pine nuts as a major dietary component, but rather the cattail and desert-blite.

The frequency of dental caries in the series was very low. The high rate of occlusal surface wear, largely attributable to the introduction of grit into the diet via seed grinding on stone metates and via a sandy environment, may have contributed to this low frequency, but most available foods were noncariogenic in the first place. There was a low frequency of cribra orbitalia and porotic hyperostosis.

25.10 The Future

The investigation concluded that the populations inhabiting the Stillwater Marsh comprised individuals who were physically robust, ate varied diets, were in relatively good health, and were not sedentary, with heavy workloads and considerable mobility. These conclusions were reached on the basis of a small sample of the population who lived and died at one place in the Great Basin over a long time period. Even though several of the conclusions could be challenged on the basis of the small and dispersed samples (a restriction that the investigators could not avoid), their bioarchaeological study shows the way for more comprehensive and definitive studies that will surely follow.

All of the Stillwater Marsh burial recoveries and excavations and all of the subsequent skeletal analyses (including the destructive ones on already broken specimens) were conducted with permission from the Fallon Paiute-Shoshone Tribe under a Memorandum of Understanding between the U.S. Fish and Wildlife Service and the Tribe. All remains discussed here and in the monograph have been reinterred in a subterranean crypt on U.S. Fish and Wildlife Service land. With appropriate permissions from the Tribe and the U.S. Fish and Wildlife Service, these remains could be made accessible to other researchers in years to come, as new research questions arise and new, more sophisticated and precise techniques are developed by skeletal biologists.